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EPC.

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### (54) Method of an apparatus for estimating product cost

(57) Cost factor data are provided from a plurality of makers (13) with respect to information such as CAD data, etc. of components which are provided by a development department (10) and stored in databases (15, 16). Manufacturing costs are calculated for the respective makers based on the cost factor data, and then

displayed. The provided information and the cost factor data stored in the databases (15, 16) are browsed through a network. The cost factor data stored in the databases (15, 16) are updated through the network. The displayed manufacturing costs are browsed through the network.

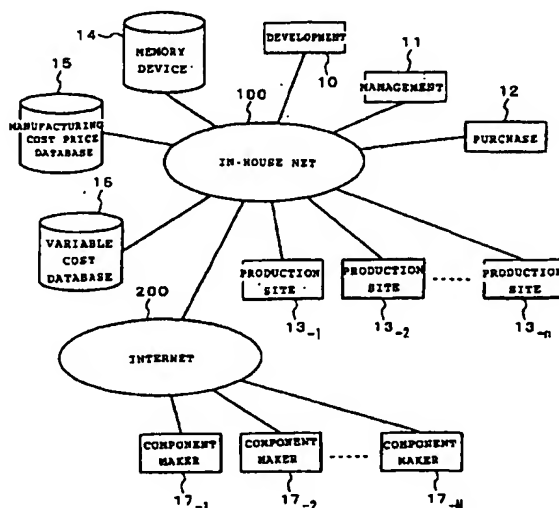


FIG.1

## Description

### Field of the Invention

[0001] The present invention relates to a method of and an apparatus for estimating the cost of a product, and more particularly to a method of and an apparatus for estimating the cost of a product to perform a cost comparison in view of a cost varying factor of the product whose cost is to be estimated and to determine the cost of the product highly accurately and quickly.

### Prior art

[0002] In recent years there have known an apparatus for estimating the cost of a product using a computer. For example, Japanese Patent Laid-open No. Hei 9-160945 discloses an apparatus having a database for storing estimation reference data and a cost element calculator for calculating cost elements based on the estimation reference data. The estimation reference data represent, for example, material information of molded articles, molding machine information, secondary processing information, etc. Japanese Patent Laid-open No. Hei 9-231265 discloses an apparatus for estimating a processing process from processing element information and product cost factor information, and calculating processing expenses based on the estimated processing process. The processing element information represents types of processing elements, the number of processing elements, the characteristics of processing elements, etc.

[0003] In the disclosed apparatus, the material expenses and the costs of processing processes are stored in a database, and the cost of a product to be estimated is calculated by entering functional information of the product, or a processing process is estimated to increase the accuracy with which to calculate the cost of a product by entering processing element information.

### Problem to be solved by the invention

[0004] However, the conventional apparatus for estimating the cost of a product and methods of estimating the cost of a product using those apparatus has the following problems because the cost is calculated from the standpoint of a manufacturer (estimator) having a single manufacturing facility.

[0005] For manufacturing a certain component, the option is not limited to a single manufacturing method, but in general a plurality of manufacturing methods or apparatuses can be employed depending on the specifications of the product and the quantity thereof. Detailed configurations suitable for respective manufacturing methods and apparatus are thus available for one component. Accordingly, it is preferable to compare and review costs covering changes in detailed configura-

tions with respect to the respective manufacturing methods and apparatus for designing a component.

[0006] For example, for completing a certain component through a plurality of processing processes, it is preferable to compare and review a cost incurred by assigning a general-purpose processing machine to a plurality of processes and a cost incurred by introducing dedicated processing machines altogether to perform a plurality of processes. For comparing and reviewing the manufacture of a component within a company and the manufacture of a component outside of the company, it is preferable to compare and review costs that have been calculated taking into account manufacturing processes within and outside of the company.

[0007] These reviews are not infrequent in daily operations, but are often carried out at the time of planning the startup of a process of mass-producing products. Even while components are being mass-produced, if the planned quantity of such components to be manufactured within the company is to be changed, then it is necessary to make the above comparison for the purpose of deciding whether a new investment for equipment is to be made or the job is to be farmed out.

[0008] With the conventional apparatus for and methods of estimating the cost of a product, the process of comparing and reviewing costs according to different manufacturing facilities or methods or according to whether the product is to be manufactured within or outside of the company is time-consuming because information required to calculate the costs needs to be entered depending on the different manufacturing facilities or methods or whether the product is to be manufactured within or outside of the company.

[0009] It is an object of the present invention to provide a method of and an apparatus for estimating the cost of a product, which will solve the above problems and are suitable for comparing and reviewing costs according to different manufacturing facilities or methods for a product or according to whether the product is to be manufactured within or outside of the company.

### Means for solving the problem

[0010] In order to attain the object described above, in accordance with a first feature of the present invention there is provided an apparatus for estimating the cost of a product, characterized in that an input device for receiving an input action, a cost calculation processor for calculating a manufacturing cost based on information inputted from the input device and cost factor data, supplied from an external source, for the calculation of the manufacturing cost, and a display device for displaying a calculated result from the cost calculation processor, the cost calculation processor being arranged to calculate manufacturing costs for respective process series when a plurality of different process series for one component are entered from the input device, the display device being arranged to display the calculated manu-

facturing costs for the respective process series.

[0011] According to the first feature, since the manufacturing costs for the respective process series are calculated and displayed based on the information inputted from the input device and the cost factor data, the differences between the costs for the different process series can easily be compared with each other.

[0012] In accordance with a second feature of the present invention, the cost calculation processor is arranged to calculate manufacturing costs for respective processes of the process series, and the display device is arranged to display the calculated manufacturing costs for the respective processes. According to the second feature, since elements making up the process series, i.e., costs for the respective processes, are displayed, factors for cost differences caused by the process series can easily be examined.

[0013] In accordance with a third feature of the present invention, in a method of estimating the cost of a product using an apparatus for estimating the cost of a product according to the first or second feature, the cost factor data is read from a database connected through a network, the database stores cost factor data entered from respective providers, and the cost factor data stored in the database are updated by cost factor data entered by the providers through the network.

[0014] According to the third feature, since manufacturing costs are calculated using cost factor data stored in the database that is updated by the cost factor data providers, costs can be compared based on latest cost factor data.

[0015] In accordance with a fourth feature of the present invention, there is provided a method of estimating the cost of a product, characterized by calculating and displaying manufacturing costs of products for respective providers based on information provided by an estimate seeker and cost factor data provided by a plurality of providers with respect to the information and stored in a database, and browsing the provided information, browsing the cost factor data stored in the database, updating the cost factor data stored in the database, and browsing the displayed manufacturing costs through a network.

[0016] According to the fourth feature, cost factor data are provided through the network from the providers who have browsed the information provided by the estimate seeker, and a manufacturing cost is calculated based on the information and the cost factor data. Since the calculated manufacturing cost can be browsed by the providers through the network to update the cost factor data, the manufacturing cost can be calculated using the latest cost factor data that have been updated.

#### Brief Description of the Drawings

[0017]

[FIG. 1] FIG. 1 is a view showing a network including

a cost estimating system according to an embodiment of the present invention.

[FIG. 2] FIG. 2 is a block diagram of the cost estimating apparatus according to the embodiment of the present invention.

[FIG. 3] FIG. 3 is a view showing a system arrangement including the cost estimating apparatus according to the embodiment of the present invention.

[FIG. 4] FIG. 4 is a flowchart showing an example of an estimating process.

[FIG. 5] FIG. 5 is a diagram showing an example of process series.

[FIG. 6] FIG. 6 is a view showing an example of a comparison of costs due to a shape change.

#### Mode for Carrying Out the Invention

[0018] An embodiment of the present invention will be described below with reference to the drawings. FIG. 1 is a view showing a network including a cost estimating system according to the embodiment. In FIG. 1, a development department 10, a management department 11, a purchase department 12, and n production sites 13-1, 13-2, ..., 13-n (hereinafter collectively referred to as "internal production department 13") have respective information processing terminals such as personal computers or the like which have a function as a component cost estimating apparatus according to the present invention. These information processing terminals are connected to a network (hereinafter referred to as "in-house net") 100 such as a LAN, an intranet, an extranet, etc.

[0019] To the in-house network 100, there are connected memory devices 14, 15 and 16 for storing data. The memory device 14 stores information of products, that is, shape data of components or the like, which are to be estimated, supplied from the development department 10. The memory device 15 (hereinafter referred to as "manufacturing cost price database 15") stores manufacturing cost prices as a fixed portion of cost factors that determine product prices. The memory device 16 (hereinafter referred to as "variable cost database 16") stores variable cost factors including production quantities, manufacturing methods, wage rates (wages per process), etc. The memory device 14, the manufacturing cost price database 15, and the variable cost database 16 can be realized as a database sharing function by known groupware.

[0020] The in-house net 100 can be connected to the Internet 200. To the Internet 200, there are connected information processing terminals of N component makers 17-1, 17-2, ..., 17-N (hereinafter collectively referred to as "component maker 17"). The information processing terminals of these component makers 17 also have a function as a component cost estimating apparatus according to the present invention. The component makers 17 may be specialists in different fields, e.g., a casting expert, a forging expert, a machining expert,

etc., or a plurality of specialists in one field.

[0021] The manufacturing cost price database 15 and the variable cost database 16 may not be connected to the in-house net 100, but may be connected to the Internet 200. The component makers 17 may be included in the in-house net 100.

[0022] FIG. 2 is a block diagram of the cost estimating apparatus in each of the information processing terminals. Those reference numerals in FIG. 2 which are identical to those in FIG. 1 represent identical or equivalent parts. In FIG. 2, an input device 1 comprises pointing devices such as a keyboard, a mouse, etc., and an interface device for receiving input actions made by these pointing devices. The input device 1 is used to enter shape data (drawing values) and manufacturing cost data of components that are to be estimated, and cost factor data such as variable cost data, etc., and commands. The cost factor data comprise data representing material costs, production facility expenses, personnel expenses, management expenses, etc. The input device 1 may include a CAD device for entering shape data of components. A display device 2 comprises a CRT or a liquid crystal display unit, and is used to display an echo of an input action made by the input device 1 and a processed result. A memory unit 3 stores data required for data processing.

[0023] A processor 4 comprises a display information processor 41, an input information processor 42, a manufacturing cost price element calculator 43, a variable cost element calculator 44, a cost calculation processor 45, and a calculated result display unit 46. The display information processor 41 extracts information required for estimation from drawing values, etc. entered from the input device 1, and detects shapes and dimensions of components. The input information processor 42 receives information, other than the information relative to shapes and dimensions of components of the information required for estimation from the input device 1, and processes the received information. Processed results from the display information processor 41 and the input information processor 42 are stored in the memory device 14.

[0024] The manufacturing cost price element calculator 43 calculates manufacturing cost price elements based on cost prices received from the manufacturing cost price database 15 and data processed by the display information processor 41 and the input information processor 42. The variable cost element calculator 44 calculates variable cost elements based on variable cost factors received from the variable cost database 16 and data processed by the input information processor 42. The cost calculation processor 45 adds manufacturing cost price elements calculated by the manufacturing cost price element calculator 43 and variable cost elements calculated by the variable cost element calculator 44 into a cost total.

[0025] Information processing terminals including the input device 1 and the display device 2 may be installed

in a plurality of locations such as an estimation seeker such as a designer or the like (the development department 10), the internal production departments 13, and the component makers 17 (hereinafter also referred to as "manufacturers"). The information processing terminals thus installed allow costs to be compared in each manufacturing site at all times based on the latest information.

[0026] FIG. 3 is a view showing a system arrangement including the above component cost estimating apparatus. Shape data, etc. entered using the input device 1 in the development department 10 are stored in the memory device 14. The purchase department 12, the internal production departments 13, and the component makers 17 can read the shape data, etc. stored in the memory device 14 through a network such as the in-house net 100, the Internet 200, or the like.

[0027] As with the memory device 14, the manufacturing cost price database 15 and the variable cost database 16 can also be accessed from the management department 11, the purchase department 12, the internal production departments 13, and the component makers 17 through a network such as the in-house net 100, the Internet 200, or the like. Particularly, the component makers 17 can write data in the variable cost database 16 in order to register and update variable costs.

[0028] Each of the management department 11, the purchase department 12, the internal production departments 13, and the component makers 17 performs cost estimating calculations based on the shape data, etc. read from the memory device 14, the manufacturing cost prices read from the manufacturing cost price database 15, and the variable cost factors read from the variable cost database 16. These departments and component makers make estimates from their own standpoints, and the estimates are stored in the manufacturing cost price database 15 or the variable cost database 16. Since each of the development, management, and purchase departments which are estimate seekers makes an estimate from its own standpoint, it can make a thorough estimate.

[0029] It is preferable that the purchase department 12, the internal production departments 13, and the component makers 17 make an estimate for each component, and the management department 11 make an estimate for a final product based on the sum of the estimates for the components. The purchase department 12 negotiates with the component makers 17 based on its own estimates. If the component makers 17 are able to change their own estimates based on the results of the negotiations, then the component makers 17 update the data stored in the manufacturing cost price database 15 or the variable cost database 16.

[0030] The development department 10 can retrieve updated estimates and review changes in manufacturing methods and shapes. The purchase department 12 and the component makers 17 can further review the changes in manufacturing methods and shapes, and

update the data stored in the manufacturing cost price database 15 or the variable cost database 16.

[0031] FIG. 4 is a flowchart showing an estimating process that is carried out in the development department 10. The estimating process is performed in an interactive fashion based on information displayed on the display device 2. When the estimating process is started, the display device 2 displays a request for the selection of component characteristics. The operator selects one of predetermined categories to which the characteristics of a component to be estimated belong. For the manufacture of motorcycles, the categories include, for example, an engine-related field E which primarily involves casting, forging, and machining operations, a frame-related field F which primarily involves pressing, sheet-metal working, resin molding, and casting operations, and a chassis-related field C which primarily involves similar operations, and an electric accessory-related field D which involves various different fabrication processes for various components.

[0032] After component characteristics, i.e., a category, are selected in step S1, cost calculating systems for respective components are activated according to the selection in steps S2 through S5. The cost calculating systems for respective components calculate costs according to cost calculating processes for a plurality of prescribed process series. For example, cost tables may be established for the respective process series, and a cost may be retrieved by specifying a component and a process series. A process series refers to a series comprising a combination of process elements put in a sequence and representing a collection of processes required to complete a certain component.

[0033] The cost tables that are established for the respective process series allow the operator to easily compare costs of the process series with each other. The operator or the designer in the development department 10 can calculate more correct costs by not only displaying costs for respective process series on the display device 2, but also changing the drawings (shape data) depending on the process series. This is because components of one type produced by forging and machining, respectively, take different shapes including wall thicknesses, beveled states, etc.

[0034] Furthermore, costs can be compared based on not only the difference between process series having different processing processes, but also the difference between the following process series. FIG. 5 is a diagram showing flow sequences of machining a cap with a boss according to a sequential process (series process) and machining a cap with a boss according to a single process (parallel process). The sequential process includes a succession of processes including a process (D1) for blanking a material P into a circular workpiece and marking the workpiece, a process (D2) of drawing the workpiece into a cup, a process (D3) of punching a central hole for a boss in the workpiece, a first burring process (D4) for finishing an inner circum-

ferential surface of a boss, a second burring process (D5) for finishing an inner circumferential surface of a hub, and a process (D6) of drawing the workpiece to a finished shape. When the material (rectangular flat plate) P is charged into the process D1, it is machined and outputted sequentially from process to process until it is completed as a component.

[0035] In the single process, the above processes D1 through D6 are not related to, but independent of, each other. Semi-products independently machined in the processes D1 through D6 are charged into following processes until they are completed.

[0036] In the above process series, the display device 2 may be arranged to display not only costs for the respective process series, but also costs for the respective processes (process elements) of the process series. If the costs are different between the process series based on the displayed costs for the process elements, then a factor which has caused the cost difference can easily be examined.

[0037] An example of a comparison of costs due to a shape change is shown in FIG. 6. In FIG. 6, manufacturers MA, MB are two component makers 17 which are specialized in different manufacturing methods or two internal production departments 13 having different production facility capabilities or personnel expenses. Calculated costs C1 were based on drawings (initial conceptual drawings) that are initially produced without concern over the abilities of the manufacturers MA, MB. The calculated cost C1 of the manufacturer MA was lower than the calculated cost C1 of the manufacturer MB. The development department 10 then applied a change a1 to the shapes in order to match the abilities of the manufacturers MA, MB, and produced drawings reflecting the change a1. The resultant calculated cost C2 of the manufacturer MB was lower than the calculated cost C2 of the manufacturer MA. The development department 10 further applied a change a2 to the shapes, and produced drawings reflecting the change a2. The resultant calculated cost C3 of the manufacturer MA was lower than the calculated cost C2 of the manufacturer MB.

[0038] By displaying the calculated costs at the respective stages of changing the shapes, the designer in the development department 10 who has seen the displayed costs can determine which manufacturer is better than the other in each stage of design change. If changes can be made up to the stage of the change a2, then an order should be sent to the manufacturer MB. If changes can be allowed only up to the stage of the change a1, then it is preferable to send an order to the manufacturer MA.

[0039] If the manufacturer MA or the manufacturer MB is selected for outsourcing, then the purchase department 12 can independently negotiate with the manufacturer 13 at each stage of design change, and can update the data of its own in the databases 15, 16 based on the results of the negotiation with the manufacturer MA or the manufacturer MB. The development depart-

ment 10 can calculate an estimate based on the latest data.

### Effect of the Invention

[0040] As is apparent from the foregoing description, according to the invention defined in claim 1, it is possible to compare and review manufacturing costs according to process series for one product, e.g., according to different manufacturing methods. According to the invention defined in claim 2, it is possible to analyze a factor responsible for the difference between manufacturing costs according to a plurality of process series.

[0041] According to the invention defined in claim 3, since manufacturing costs are calculated using cost factor data stored in a database that has been updated by cost factor data providers, costs can be compared based on the latest cost factor data. For example, if the cost factor data providers are a plurality of makers or manufacturing sites, then variable factor data in each of the makers and manufacturing sites can be reflected in the manufacturing costs, and the costs according to the makers and manufacturing sites can be compared with each other and their appropriateness can be judged.

[0042] According to the invention defined in claim 4, cost factor data are provided through a network from a plurality of providers who have browsed the information provided by an estimate seeker, and a manufacturing cost is calculated based on the information and the cost factor data. Since the calculated manufacturing cost can be browsed by the providers through the network to update the cost factor data, the manufacturing cost can be calculated using the latest cost factor data that have been updated. The providers of cost factor data, i.e., a plurality of makers, can be update the cost factor data which they have provided, depending on the information provided by the estimate seeker, it is possible to calculate a highly accurate cost in a short period of time depending on the information provided by the estimate seeker.

### Claims

1. An apparatus for estimating the cost of a product, **characterized in that**

an input device for receiving an input action;  
a cost calculation processor for calculating a manufacturing cost based on information inputted from said input device and cost factor data, supplied from an external source, for the calculation of the manufacturing cost; and  
a display device for displaying a calculated result from said cost calculation processor;  
said cost calculation processor being arranged to calculate manufacturing costs for respective process series when a plurality of different

process series for one component are entered from said input device;  
said display device being arranged to display the calculated manufacturing costs for the respective process series.

2. The apparatus for estimating the cost of a product according to claim 1, wherein

said cost calculation processor is arranged to calculate manufacturing costs for respective processes of the process series; and  
said display device is arranged to display the calculated manufacturing costs for the respective processes.

3. A method of estimating the cost of a product using the apparatus for estimating the cost of a product according to claim 1 or 2, **characterized in that**

said cost factor data is read from a database connected through a network;  
said database stores cost factor data entered from respective providers; and  
said cost factor data stored in said database are updated by cost factor data entered by the providers through the network.

4. A method of estimating the cost of a product, **characterized by:**

calculating and displaying manufacturing costs of products for respective providers based on information provided by an estimate seeker and cost factor data provided by a plurality of providers with respect to the information and stored in a database; and  
browsing the provided information, browsing the cost factor data stored in said database, updating the cost factor data stored in said database, and browsing the displayed manufacturing costs through a network.

### **Amended claims in accordance with Rule 86(2) EPC.**

1. An apparatus for estimating the cost of a product, **characterized in that** it comprises:

- an input device (1) which comprises pointing means and interface means,
- a display device (2),
- a memory unit (3) which stores data required for data processing,
- a processor (4) which comprises:
  - a display information processor (41),
  - an input information processor (42),

- a manufacturing cost price element calculator (43),
  - a variable cost element calculator (44),
  - a cost calculation processor (45),
  - a calculated result display unit (46), 5
- a memory device (14) which stores information of products,
  - a manufacturing cost price database (15) which stores manufacturing cost prices as a fixed portion of cost factors which determine cost prices, 10
  - a variable cost database (16) which stores variable cost factors.
2. A system for estimating the cost of a product which comprises, connected to the Internet: 15
- an in-house network (100) to which are connected: 20
    - information processing terminals of:
      - \* a development department (10)
      - \* a management department (11)
      - \* a purchase department (12) 25
      - \* n internal production departments (13),
  - information processing terminals of N component makers (17), 30
- wherein said information processing terminal comprises a cost estimating apparatus according to claim 1. 35
3. A system according to claim 2, wherein the manufacturing database (15) and the variable cost database (16) are connected to the Internet.
4. A system according to claim 2, wherein the component makers (17) are included in the in-house net (100). 40

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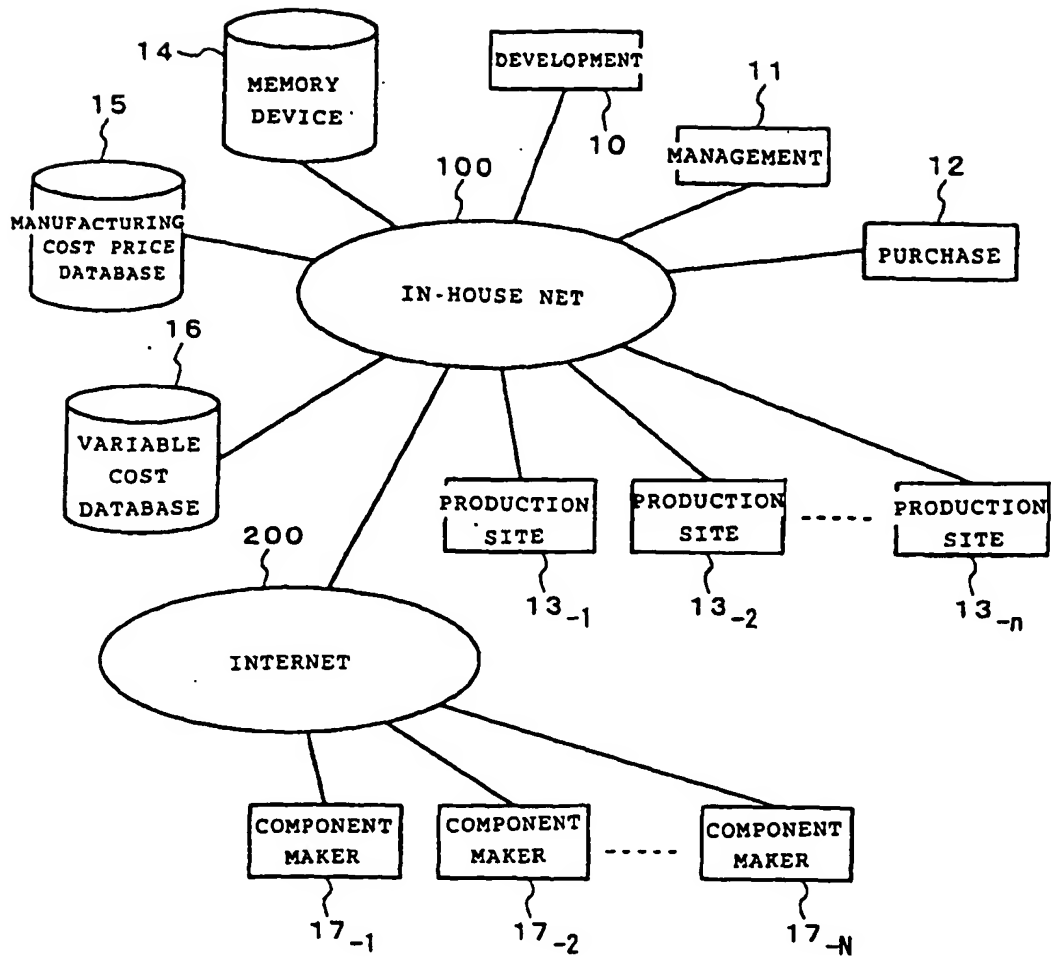


FIG. 1



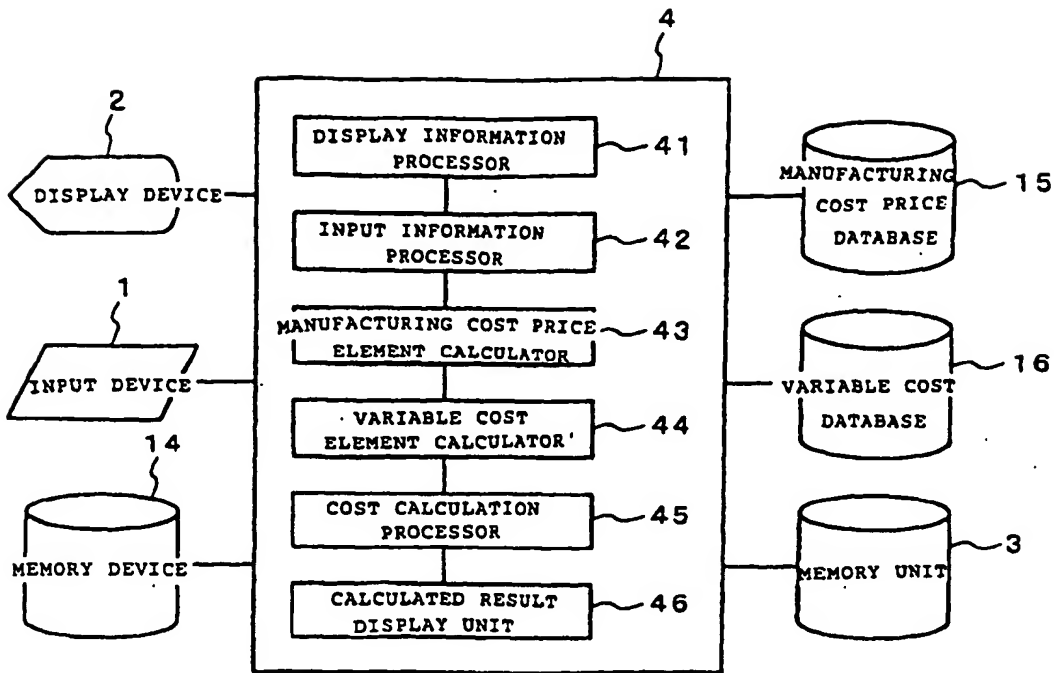


FIG. 2

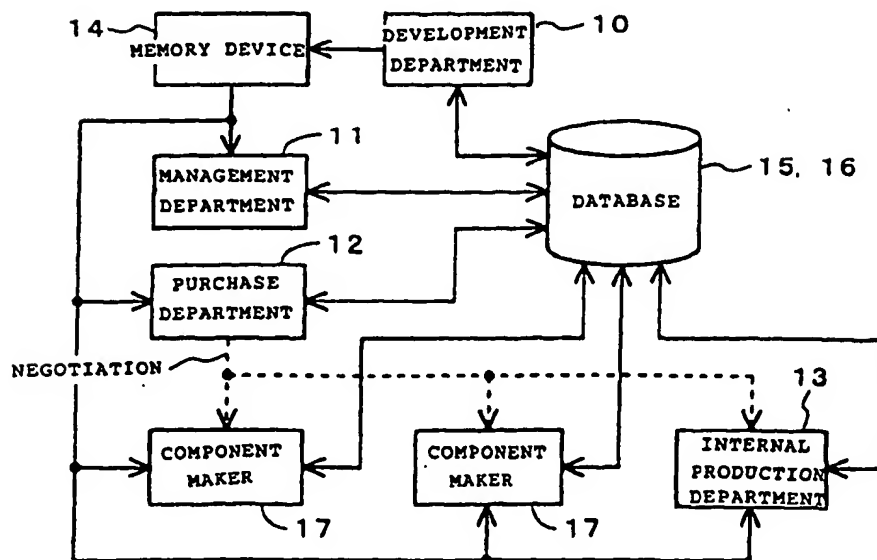


FIG. 3

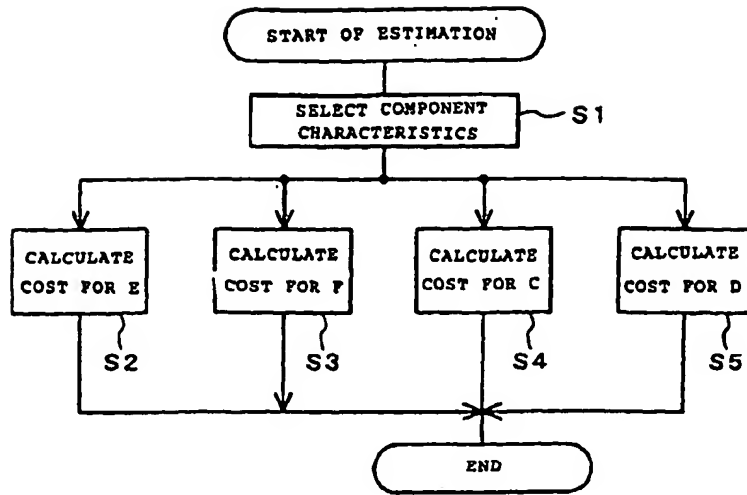


FIG. 4

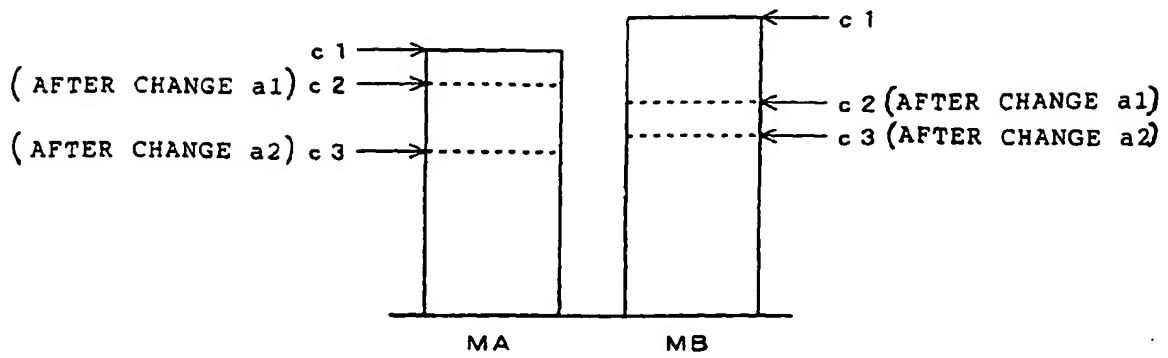


FIG. 6

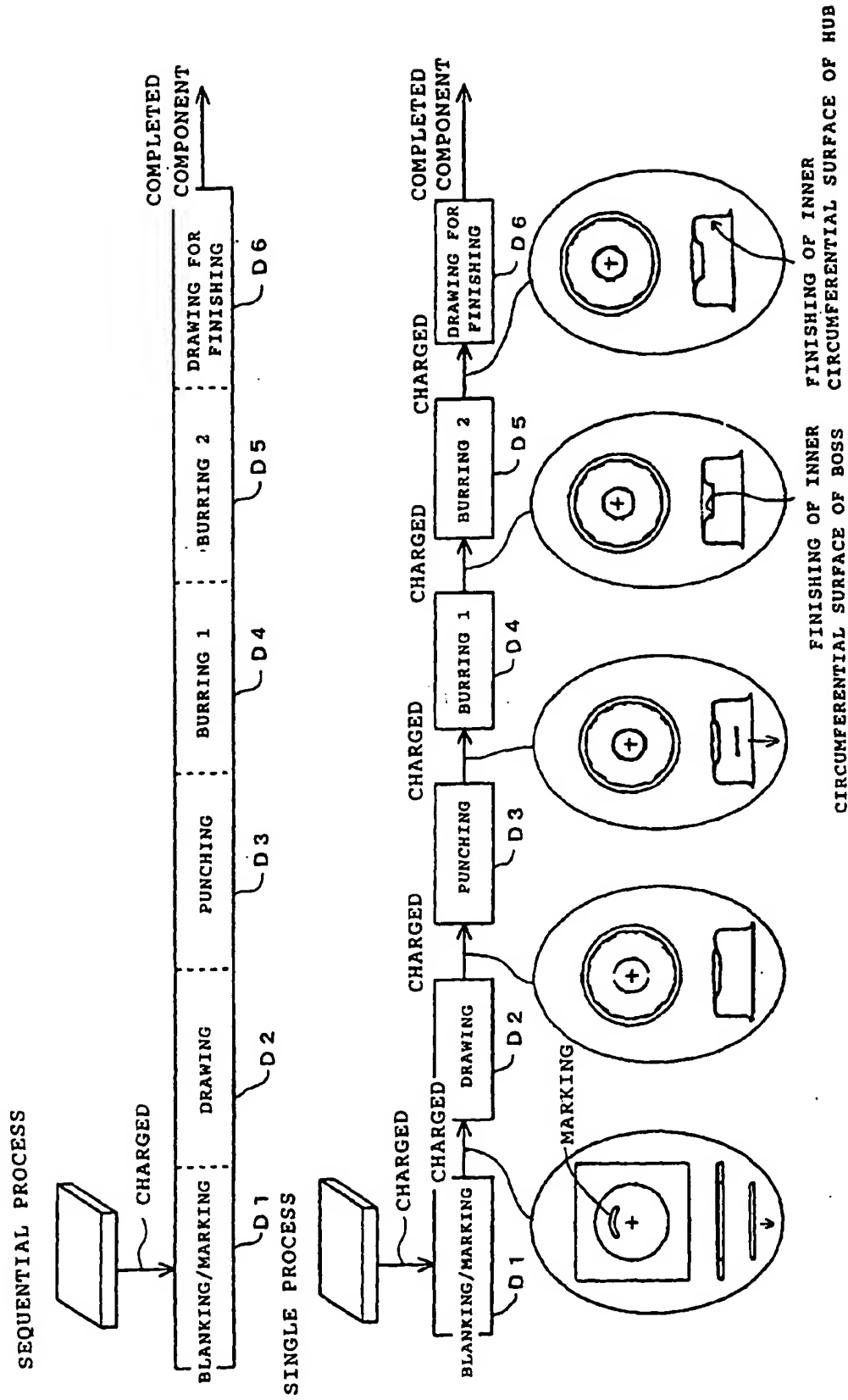


FIG. 5



European Patent  
Office

# DECLARATION

Application Number

which under Rule 45 of the European Patent Convention EP 01 40 1689 shall be considered, for the purposes of subsequent proceedings, as the European search report

<p>The Search Division considers that the present application, does not comply with the provisions of the EPC to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of all claims</p> <p>Reason:</p> <p>The subject-matter claimed in claims 3-4 falls under the provisions of Article 52(2) and (3) EPC, such subject-matter relating to a method of doing business as such.</p> <p>Claims 1-2 relate to commonplace technological features for performing the business method of the method claims. Although these claims do not literally belong to the method category, they essentially claim protection for the same commercial effect as the method claims. With reference to the Guidelines, 8-VIII, points 1-6, the Search Division considers that searching such commercial features would serve no useful purpose. This applies to the remaining commonplace technological features of these claims as well.</p> <p>The applicant's attention is drawn to the fact that a search may be carried out during examination following a declaration of no search under Rule 45 EPC, should the problems which led to the declaration being issued be overcome (see EPC Guideline C-VI, 8.5).</p> <p>---</p> <p>-----</p>		<p>CLASSIFICATION OF THE APPLICATION (Int.Cl.7)</p> <p>G06F17/60</p>
Place of search	Date	Examiner
THE HAGUE	20 August 2001	Bowler, A

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